

got answers from Prof. Sylvester's infinitely thin book-worm.

If the examination-system is to be maintained without being on the one hand hopelessly discredited, or on the other lapsing into a kind of ceremonial observance like academic dress or a Guy Fawkes celebration, something must seriously be done to ascertain the real relation between A and A'. It is generally presumed that the object of "plucking" a candidate is to indicate to him his imperfect knowledge. But though the student of the subject called A' is usually plucked by the examiner in A it is not clear that what may be called the moral result is in any way satisfactory. The examiner is disgusted equally with the candidate who has likely enough done his very best, just as the infinitely thin book-worm might do his best. The candidate grinds away at his A' with more assiduity than ever if he is modest enough to think his ignorance to be in fault; but this only makes his subsequent failures with the examiner in A more assured, because the radical incommensurability of A and A' becomes more intensified.

There is really reason to think that underneath the rational fabric of science as understood by intelligent persons of common sense there is a vast substratum of something altogether different, but with which a large number of individuals are quite seriously occupied. A' is only a term in fact of a very considerable series. Every now and then in the pages of this journal strong evidences crop up of the existence of this singular body of knowledge. This existence, however, is scarcely really grasped by the scientific world proper, and it might be compared to a sort of inverse of Prof. Tait's unseen universe.

The present state of things can hardly go on. It is quite certain that, whatever intrinsic interest science of the A' type may possess, it is of no kind of practical use to ordinary human beings. If it cannot be displaced by the real thing of which it is a kind of phantom, it is a serious question whether the struggle of the examination-room had better not be for a time suspended.

In the meantime it is very important to investigate the true nature of this phantom science. A little work, of which the second edition has been lately sent to this journal for review, appears to belong to its literature, which there is reason to think is rather copious. This particular publication is part of the "Students' Aids Series," bears the motto, "*Mens sana corpore sano*," and deals with botany.¹ It is impossible to seriously criticise it; indeed, from the point of view of what has been said above it would not be easy to do so. We may content ourselves with reproducing textually from its pages the *entire account* given of a well-known and very characteristic group of Thallophtyes:—

THE OLIVE SEaweEDS.

These weeds vary in general appearance from small tufted filaments to immense stalks terminated by a branched thallus.

¹ "Aids to Botany." By Armand Semple, B.A., M.B., Canrab.; L.S.A., M.R.C.P., Lond., Physician North-Eastern Hospital for Children, Hackney, Physician to the Royal Society of Musicians, late Senior Examiner in Arts at Apothecaries' Hall, late Medical Clinical Assistant and Surgical Registrar at the London Hospital, author of the "Essential Features of Diseases of Children," "Aids to Chemistry" (Inorganic and Organic), "Aids to Materia Medica" (Inorganic and Organic), "Tablets of Materia Medica," "Aids to Medicine." (Double Part.) Third Thousand. (London: Baillière, Tindall, and Cox, King William Street, Strand. Dublin: Fannin and Co. Grafton Street. Edinburgh: MacLachlan and Stewart, South Bridge. Glasgow: A. and W. Stenhouse, College Gate. New York: Putnam and Sons, 1883.)

In the higher forms a shrubby aspect, a kind of root, and an epidermal layer are observed. Their colour is not bright green, but in general olive.

The zoospores originate in **Oosporangia**, situated at ends or joints of the frond, or in each of the cells of a filamentous body called a **Trichosporangium**; they resemble those of the Green Alga.

The zoospores from the Trichosporangium have been mistaken for spermatozooids.

The spores reside in sacs termed **Perisporos**, having a lining membrane, the **Epispore**.

The perisporos or sporangia are either scattered or are arranged in **Sori** or groups on the frond's surface, or in cavities, **Scaphidia** or conceptacula, communicating by a pore with its surface.

The scaphidia may appear as club-shaped masses or receptacula at the edges of the frond.

The antheridia are ovate sacs which contain **Antherozoa** or **Phytozoa** (two ciliated spermatozooids), and appear on slender filaments in the same or other plants, and in the same or other conceptacles as the spores. If on the same plant, they are called **Monœcious**; if on different, **Diœcious**. When in the same conceptacles with the spores, they are Hermaphrodite. To the slender filaments destitute of antheridia the name of Paraphyses is given.

We must leave to our botanical readers to notice for themselves where this instructive specimen of A' science differs from the kind of lesson which an ordinarily constituted teacher of real botany would try to communicate to his pupils. At any rate we may ask, would any one having learnt all this by rote (for there is reason to think that such is the method insisted upon) be secure in recognising a piece of bladder wrack when shown to him, or certain of any single fact in its life-history.

A curious point about the A' science is the copiousness and more or less unintelligibility of its terminology. There is no doubt, however, that this is very generally mastered, however repulsive such a task might seem at first sight. But the problem is still unsolved as to what is the end gained. With the same effort it is probable that the rudiments of an Oriental language might be acquired—say Arabic—and the question arises whether in every way this would not be more profitable.

LEFROY'S MAGNETIC SURVEY IN CANADA

Diary of a Magnetic Survey of a Portion of the Dominion of Canada, chiefly in the North-Western Territories, Executed in the Years 1842-44. By Lieut. Lefroy, R.A., now General Sir J. H. Lefroy, C.B., F.R.S., &c. (London: Longmans and Co., 1883.)

THIS record of magnetical work performed forty years ago by Lieut. Lefroy of the Royal Artillery—now General Sir J. Henry Lefroy—is a contribution of interest to the science of terrestrial magnetism.

The Magnetic Survey of the British Possessions in North America authorised by Her Majesty's Government in the year 1841 at the recommendation of the Royal Society, and in great part executed in 1843 and 1844 under the supervision of the late Sir Edward Sabine, had for its primary objects the determination of the regular and irregular changes of the magnetic elements, especially that of the horary variation of the declination; this variation being then known as subject to wide differences in the high magnetic latitudes of the northern hemisphere

as compared with those observed in middle latitudes, both in respect of the turning hours and in the direction of the movement at the same local time. Furthermore, investigation of observations made by Polar voyagers and Arctic travellers had shown that the northern part of these British possessions was a region of peculiar interest as comprising in its area the most powerful of the two foci of magnetic intensity in the northern hemisphere, and also the locus of vertical dip commonly recognised as the North Magnetic Pole.

To Lieut. Lefroy—furnished with transportable magnetometers—was assigned the arduous and responsible duty of traversing this region of such striking magnetical interest, to determine the absolute values of the declination, inclination, and intensity at available stations; and at one or more fixed winter residences in high latitudes to make hourly and term day observations of those regular and irregular fluctuations in the movements of the needle presumed to exist in values of more than ordinary magnitude.

Sir Henry Lefroy's present volume contains the diary of his journeys—these latter extending to 5480 geographical miles—in which is given in more or less detail the magnetical elements determined at three hundred and fourteen stations, combined with such astronomical observations as were necessary, in the then imperfect state of the maps of the region traversed, to approximately assign the geographical positions of the places of observation.

The extended series of hourly and term day magnetical and meteorological observations made at the fixed winter and spring residences [1843-44] of Fort Chipewyan on Lake Athabasca (lat. $58^{\circ} 43' N.$, long. $111^{\circ} 19' W.$), and at Fort Simpson on Mackenzie River (lat. $61^{\circ} 51' N.$, long. $121^{\circ} 25' W.$), with their very complete and able discussion by Capt. Lefroy, were printed by order of Her Majesty's Government in 1855. This masterly work is well known to those interested in the science of terrestrial magnetism. The Diary now for the first time published is a fitting sequel to the earlier work; and is not the less valuable from what may appear to be its tardy production. The author's preface—which conveys a graceful tribute to his old chief—in a few words clears up the seeming anomaly. He says:—

"The renewed attention directed to the distribution and periodical changes of the earth's magnetism in the North Polar region, suggests an endeavour on my part to present the observations of my magnetical survey of 1843-44 with fuller explanation, and in a form more convenient for reference than that in which they were originally published" [Sabine's 'Contributions to Terrestrial Magnetism,' No. vii. *Philosophical Transactions*, 1846, and No. xiii. *Philosophical Transactions*, 1872]; "and being still the principal authority for the received position of the focus or pole of greatest magnetic intensity, as well as for the lines of equal magnetic force, equal inclination, and equal variation over a large part of the continent of North America, it is certain that whenever they come to be repeated, the observer of the future will inquire for particulars not contained in, and not suitable for, the *Philosophical Transactions*."

Apart from the value of a full record of the observations made over so great an extent of continental America, is the consideration of the graphical treatment of the isoclinical and isodynamic lines, as embodied on maps accompanying the Diary. The author dwells on the difference

in rendering the mapped results on the system followed by Sabine—as given in the *Philosophical Transactions*—and on that adopted by himself. Sabine's aim was to present, over the vast area he was dealing with, the normal values of the magnetical elements, free—so far as his judgment permitted—from the local disturbances experienced at individual stations, depending on geological conditions; and stations at which the disturbances obviously affected the assumed normal values were designedly rejected. Lefroy's treatment includes every station at which he set up his instruments, rejecting no observation because of its anomaly where there was no internal appearance of error. By the one investigator we are thus presented with a harmonious mapped system of regular lines or curves indicating equal values of the magnetic elements; by the other the equivalent lines of equal values are more or less sinuous, in some places much distorted, and losing the semblance of regularity.

In the case of the isoclinical lines as so developed, the author partly infers that their greater inflections bear some relation to the courses of the rivers; and he further draws attention to his isodynamic lines or curves, differing both in form and position from those of Sabine.

In a discussion as to the appositeness of either of the systems pursued, it must be borne in mind that, at numerous well-known points on the earth's surface, a movement made by the observer of the magnetic needle a foot or two vertically, or a few feet horizontally, either way, considerably affects the observations. This is notably the case at many oceanic islands, and a marked example is to be found on our own coasts at Canna near the island of Skye. Sir H. Lefroy's experiences in this direction are well marked at Stations LII. and CXXI., where the total force observed was 15.26 and 15.38 respectively; the normal value undoubtedly was about 14.10 and 14.15 ; the disturbance from a local geological cause thus increased the total force by $1/14$ th. It is therefore certain that, unless we have some fairly approximate knowledge of the normal value of the magnetic elements at the disturbed station, we should remain in ignorance of the extent of the disturbance.

In the present state of our knowledge of the distribution of magnetism in the several determinate values of declination, inclination, and intensity over the earth's surface—limited in the best explored regions to a very small number of points of observation compared with the great areas of land and water which they represent—it appears premature to give interpretation to local disturbances as being connected with topographical features rather than geological. On general grounds we must consider the delineation of the normal lines in any region as a primary need, whether in a theoretical or a practical direction.

Local magnetic disturbances demand a special study; this has been given effect to in a theoretical direction by Lamont in Germany ("Researches on the Direction and Intensity of Terrestrial Magnetism in Northern Germany, Belgium, Holland, and Denmark in the Year 1858," Munich, 1859), and practically is being now worked out in the United States; it is understood a special magnetic survey of the State of Missouri is nearly complete.

As magnetical observations multiply over large areas of land, it is possible that the normal lines may be found

to lose symmetry by disturbing causes which may extend over many square degrees of surface, as distinct from local irregularities. Lamont's observations in continental Europe point to this. A first essay on a large scale has been lately made by the able and diligent magnetician, C. A. Schott, to chart the distribution of the magnetic declination of the United States for the epoch January 1885. In this work distinct notice is taken of all local disturbances in the direction of the magnetic needle, the number of observing stations being 2359. This valuable essay is published as an Appendix to the Report for 1882 of the United States Coast and Geodetic Survey.

It should be observed that in Sir Henry Lefroy's maps the lines of magnetic declination are reproduced as given by Sabine; in Mr. Schott's paper this is the only element discussed, doubtless from the more ample material at his command, and possibly from its practical value for topographical, geological, or mining purposes.

Whenever the time arrives for undertaking a magnetic survey of the British possessions in North America, Sir Henry Lefroy's Diary will be invaluable as a pioneer work. At the present time his early published magnetical and meteorological observations at Lake Athabasca and Fort Simpson are of great interest in connection with those recently made in a neighbouring region by Capt. Dawson, R.A., at the International Circumpolar Station, Fort Rae.

F. J. EVANS

EXCURSIONS OF AN EVOLUTIONIST

Excursions of an Evolutionist. By John Fiske. (London: Macmillan and Co., 1884.)

MR. FISKE is certainly one of the most successful of the writers who have undertaken the task of popularising the many new ideas which have been originated by the theory of evolution. He has not himself added anything of any importance to these ideas; but, having accepted them with enthusiasm, he represents them to the public with so much force and clearness, as well as grace of literary style, that while reading his pages we feel how the function of a really good expositor is scarcely of less value in the world than that of an originator. The applicability of these remarks to his earlier works will, we think, be generally recognised by the readers of this journal; and, if so, they are certainly no less applicable to the series of essays which we have now to consider.

The first essay is on "Europe before the Arrival of Man," and it gives an exceedingly clear and well-condensed *résumé* of the present standing of the question as to the probable date of man's appearance in geological time. Next in logical order we have three essays on "The Arrival of Man in Europe," "Our Aryan Forefathers," and "What we learn from Old Aryan Words." Within the compass of the pages allotted to them we do not think that it would be possible to give a more instructive and entertaining history than is presented by these chapters. The fifth essay is on the question, "Was there a Primitive Mother-Tongue?" which is very conclusively answered in the negative. "Sociology and Hero-Worship" is devoted to arguing the relations that subsist between a genius and the age or society in which he lives; this is appropriately followed by the essay on "Heroes of Industry," which is a kind of

historical sketch of the philosophical principles that govern the possibilities of invention. A new point of departure is taken in the next three essays on "The Causes of Persecution," "The Origins of Protestantism," and "The True Lesson of Protestantism." Here the main argument is that the rise of Protestantism and the decline of the persecuting spirit are due to an increasing recognition of the right of private judgment, coupled with an increasing refinement of moral feeling. The theory of corporate responsibility, which is more or less essential to the integrity of the social state in the earlier stages of its development, becomes gradually superseded by the theory that the individual is alone responsible for his beliefs and actions; hence the growing recognition of the right of private judgment. "The Meaning of Infancy" is a brief restatement of the author's views already published in his "Cosmic Philosophy." These are the views which deserve to be regarded as perhaps the most original that Mr. Fiske has enunciated. The general fact that the protracted period of infancy among the anthropoid apes (and therefore presumably among the brutal ancestry of man) must have had a large share in determining the evolution of man is a fact which could scarcely escape the observation of any attentive evolutionist; but Mr. Fiske is the only writer, so far as we are aware, who has treated this fact with the consideration that it deserves. Of the remaining essays, "Evolution and Religion" is an after-dinner eulogium on Mr. Herbert Spencer, "A Universe of Mind-Stuff" is an exposition of Clifford's essay upon this subject, and "In Memoriam: Charles Darwin," is a well-written obituary review of Mr. Darwin's life and work.

As we have not detected any errors on matters of fact, the only criticisms we have to make pertain to matters of opinion. In particular, it appears to us that, in his anxiety to raise the cosmic theory of evolution into a religion of cosmism (or, as he terms it, in his earlier work, "Cosmic Theism"), Mr. Fiske entirely loses the clearness of view and precision of statement which elsewhere characterise his work. Although no friend or admirer of Comte, with a strange inconsistency he follows implicitly the method of the French philosopher in blindfolding judgment with metaphor, and then, without rein or bridle, running away upon a wild enthusiasm. We have here no space to justify this general statement, but we feel sure that no sober-minded man can read the after-dinner speech or eulogy on Mr. Spencer without feeling that its extravagance runs into absurdity. We have no wish to deprive Mr. Fiske of any happiness that he may derive either from his "religion" or from his "hero-worship"; but we cannot review his essays without observing that in neither of these respects is he likely to meet with much sympathy among "men of science," to whose opinion he habitually professes so much deference.

GEORGE J. ROMANES

OUR BOOK SHELF

The Zoological Record for 1882. Being Vol. XIX. of the Record of Zoological Literature. Edited by Edward Caldwell Rye, F.Z.S., &c. (London: Van Voorst, 1883.)

ALMOST before the shadow of 1883 had passed away, the "Record of the Zoological Literature of the Year 1882"